InRoads: an Overview

The Essence of InRoads

In its broadest sense InRoads creates a 3D electronic model of an engineering job and provides the means to create construction documents from the 3D model.

A civil engineering project can consist of a wide variety of objects with engineering significance, including such things as centerlines, asphalt courses, shoulders, Valley Gutters, signs, ditches, underground utilities and rights of way, to name just a few. The current DTM or the Digital Terrain Model can model all this information with an accuracy exceeding that required for construction.

Creation of such a proposed model most always relies on mathematical equations which exceed the DTM's current ability to model. The exact mathematical representation of circular, parabolic and transitional curves cannot be maintained within the DTM and requires an additional file format, the Geometry Project or ".alg" (for **al**i**g**nment) file to store that information. Ultimately, the DTM format may be enhanced so that it alone can completely and exactly represent all aspects of the Engineering Model (this is my extrapolation; not a promise from Bentley), but at least in the near future, two file formats will be necessary.

Currently the Geometry Project and Digital Terrain Model provide the complete physical model of an engineering project. All graphics and supporting data for construction documents can be derived from these files. It is important to note that all the information that we in the civil engineering community use to bid and construct projects is "secondary information" derived from the InRoads data model. When managing InRoads projects or engineering departments using InRoads, it is important to understand that the electronic model the engineers design and the information on the paper documents are not necessarily one and the same.

Primary Data Model Files:

The Geometry Project (.alg).

This file contains all Geometry information, including points, horizontal and vertical alignments, and superelevation definitions. This file is essentially self-contained, encapsulating all geometry related information. From the Geometry Project all the familiar and required Geometric information can be derived.

The Digital Terrain Model. (.dtm).

The DTM can contain and geospatially represent everything that exists and will be created as part of an engineering project subject to a definable maximum error. Spirals, for example, are represented by linestrings (or polylines) of connected straight chords. While the DTM can output physical location of the elements to be built within an acceptable error, the data format cannot support, for example, reports that provide the "geometric sense" that is required for civil engineering mathematics (curve radii, superelevation rates and transition information, etc.).

Proposed roads can represent complex and sophisticated engineering requirements and are often defined by a potentially long series of criteria. In creating Proposed Corridors or "Roadways" InRoads mirrors the typical engineering specification: a library of typical sections and a "table" listing which typical sections are dropped where along an alignment. While the InRoads "Roadway Definitions" provide repeatability and documentation as to the major steps used to create a proposed corridor, they are support files. The end result of the process and the source for all earthwork drawings and calculations, regardless of the complexity of the engineering, can be a single complete DTM.

Settings/Support Files

- A Preference file controls the details of the cosmetics and a variety of engineering settings.
- A Style file, which controls how the horizontal annotation is displayed.
- InRoads uses a number of user-specified and user-definable files for settings for specific engineering tasks (such as superelevation rate tables). The Preference file stores which specific files are used.

Engineering Support Files
These files are used in the definition of the proposed roadway corridor and creation of the proposed DTM. Together these files provide the ability to archive, repeat and edit corridor model creation.

- A "Typical Section Library" is used to define typical road sections, or "templates," side slope or catchpoint definitions
- A "Roadway Library" is used to specify how a proposed roadway is defined, what templates are "dropped" where along a proposed road.

CAD Graphics

While CAD graphics are the "be all, end all" of production sheets, they are virtually irrelevant to the InRoads model. While InRoads can import information from CAD graphics and does a wonderful job creating and managing CAD Graphics, InRoads does not need or use graphics for any of its calculations. If you lose or erase graphics, InRoads does not care. The information InRoads needs is stored in its own files.

Some important concepts about CAD graphics in InRoads:

- every graphic is customizable. If you don't like it you can change it
- the graphics are normal CAD graphics, to the CAD program they behave like every other graphic
- if you delete the InRoads graphics, InRoads is okay with that, InRoads has everything it needs in its own files (.alg, .dtm., etc.)
- all graphics that are displayed as part of a single Apply are displayed in MicroStation as a single graphic group (which permits easy deleting or other manipulation)

Debugging

Sometimes, InRoads and the graphics get out of synch. Guess who is right: InRoads. InRoads always wins. When debugging in InRoads, it is important to realize that the InRoads graphics are a snapshot of the InRoads model when the graphics were created. That model may have changed since the graphics were created (many InRoads commands delete old bad graphics automatically).

Primary InRoads Debugging Steps

Prior to Trouble:

1. Anticipate and Authenticate at every step. This way you know you are in trouble as soon as you get in it.

Once something seems amiss:
Don't trust the graphics!

1. Open a blank CAD file or Save the file to a new like "debug" or "deleteme".
2. Delete all the graphics.
3. Use an appropriate display tool to create new, "in-synch" graphics. These can be trusted because they came straight from graphics.
4. If things look awry, use a review or evaluation tool to examine the questionable object in more detail.